National Weather Service Des Moines' Newsletter

THE WEATHER WHISPER

Summer 2013

Brenda Brock—NWS Des Moines MIC Retires

by Aubry Bhattarai, Journey Meteorologist

In June, the National Weather Service in Des Moines said good-bye to Meteorologist-in-Charge (MIC) Brenda Brock as she retired after over 45 years of government service. Brenda was the MIC in Des Moines for 15 years, arriving in 1998.

Brenda began working for the federal government in March 1967, working for the Department of Veterans Affairs. After returning from Keflavík, Iceland (now Reykjanesbær, Iceland) where she was working with the Department of Defense, Brenda began working for the National Weather Service in St. Louis, Missouri. Growing up in central Arkansas, Brenda always had an interest in weather, and was excited about the future of the National Weather Service as it began to undergo changes.

Brenda worked in many NWS offices across the county, including St. Cloud, Minnesota; Memphis, Tennessee and Cheyenne, Wyoming. In Cheyenne, Brenda received a Master's Degree in Political Science from the University of Wyoming; she had previously received her Bachelor's Degree in Meteorology. Brenda worked in Cheyenne for over nine years, working as a meteorologist technician, forecaster and hydrologist. Brenda left Cheyenne to become the MIC in Grand Junction, Colorado,

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I have been so privileged to work for the NWS and with such dedicated professionals . The partnerships of working with the emergency management community, weather observers, storm spotters and customers have made my job so rewarding. We've certainly been through a lot together as we've faced the challenges of Mother Nature's awesome power.

"We are a product of our consequences and environment" and you have been involved in much of mine. After several years with the VA and DOD, I began my 42+ years and 8 locations within the NWS. I thank you for accompanying me on a portion of my journey and the opportunity to serve. My best to you all!
-Brenda

IN THIS ISSUE

Weather-Ready Nation: Saving Lives and Livelihoods

Editors

Ken Podrazik
Aubry Bhattarai

Cover photo courtesy of Kevin Skow

Brenda receiving her NOAA Certificate of Loyal Service from Acting Central Region Director John Ogren.

Thank you for your service Brenda! We wish you all the best in your retirement!

Brock Retirement

(Continued from page 1)

followed by an MIC position in Missoula, Montana before transferring to Des Moines.

Brenda was proud to serve the public through the NWS. As Meteorologist-in-Charge, she enjoyed offering support to others, being able to help them reach their career goals. Her favorite part of working in the NWS was the people she worked with and the partnerships she developed. Of course, the weather tops her list too!

Some memorable events Brenda experienced throughout her career include the 2008 Parkersburg/New Hartford, Iowa tornado. In 1996, a hazardous materials event occurred in Missoula, Montana when a train derailed and spilled chlorine gas. During this event, Brenda was evacuated from her home, and Interstate 90 was closed for over two weeks!

In retirement, Brenda will continue playing women's senior and coed softball and remain involved with her church. She is looking forward to spending more time with her family and friends, including her Shih Tzu puppies, Bernard and Bridgette. She hopes to continue learning, and plans to take classes such as guitar and Spanish, or whatever else interests her. She will keep up with the weather, and continue as a CoCoRaHS observer.

Weather's Most Deadly Hazard—Heat

by Aubry Bhattarai, Journey Forecaster

While many Iowans enjoy outdoor activities in the summer, summertime brings the most deadly weather phenomena: heat. Heat is the number one weather related killer! In a normal year, about 175 Americans die as a result of summer heat. In fact, in a 40-year period from 1936-1975 nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In a 1995 heat wave, more than 700 deaths in Chicago, IL were attributed to the heat.

Cities pose special hazards when it comes to heat. The stagnant atmosphere traps pollutants in urban areas, which adds to the stresses of hot weather. In addition, concrete, asphalt and other industrial materials common in cities trap heat during the day, and keep the air temperature warmer at night. In addition, cars become killers, with many children and pets dying from hyperthermia (heat stroke) after being left alone in a vehicle in the hot sun. On average (since 1998) 37 children die in the US each year from hyperthermia in vehicles, with 575 total deaths since 1998. Through the end of June, 15 children have died this year already. Of these tragic deaths, over half of them were because children were "forgotten" by caregivers, with over half aged 1 year-old or younger.

Even relatively mild temperatures outside can heat a car rapidly inside as the sun beats down. Here at the National Weather Service office in Des Moines, we conducted an experiment to see how hot the inside of a car would get. We placed a thermometer in a car from 9:30am-4:30pm. The afternoon high temperature outside that day was 80°F and the temperature in the interior of the car reached 117°F! The experiment proves that even on a relatively mild day, the interior of a car can become dangerously hot for children or pets left unattended.

Thermometer in car experiment

Remember to always check the back seat before leaving your vehicle! Here are other tips to help you beat the summertime heat:

- Never leave children or pets alone in enclosed vehicles.
- Stay hydrated by drinking plenty of fluids even if you do not feel thirsty. Avoid drinks with caffeine or alcohol.
- Eat small meals and eat more often. Some foods can increase metabolic heat production and increase water loss.
- Wear loose-fitting, lightweight, light-colored clothing. Light-colored clothing reflects sunlight and can help your body maintain normal temperatures.

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2008 Flood vs. The Great Flood of 1993—and Looking Ahead

by Jeff Zogg, Senior Hydrologist

This year marks the 5-year anniversary of the 2008 flood and the 15-year anniversary of the Great Flood of 1993. Both floods were historic in their own right. Although these floods were different in many ways, they shared one major similarity—they both devastated communities and livelihoods.

This article will provide a brief comparison between the floods of 2008 and 1993 in Iowa. In addition, major changes within the NWS from 1993 to 2008 will be highlighted. Finally, a look to the future will provide a glimpse of what to expect going forward. Since these topics could lend themselves to an entire newsletter itself, various references with additional information have been included at the end of this article.

Antecedent Conditions

One similarity between the two events was the antecedent hydrologic conditions leading up to both floods. Above normal soil moisture existed across much of the Iowa region beforehand. The relatively wet soil conditions reduced the ability of the ground to absorb additional rainfall, thus resulting in a greater chance of runoff. The precipitation patterns which resulted in the wet soils were different though. In the fall of 1992, precipitation amounts were 125 to 150% of normal in the Iowa region. Winter 1992-1993 precipitation was near to above normal with heavy snowfall across the upper Mississippi River basin in February 1993. Wet conditions continued during the spring of 1993 and into the summer. In contrast, the Iowa region received only 50 to 75% of normal precipitation during the fall of 2007. Winter 2007-2008 precipitation across Iowa was above to much above normal with a deep and moisture-rich snowpack in place especially across eastern Iowa going into the spring of 2008.

Downtown Cedar Rapids, Iowa on June 13, 2008 as the Cedar River crested more than 11 feet above its previous record. Photo by the Iowa Civil Air Patrol.

Meteorology

The meteorology patterns which led to the flooding differed in both events. In 1993, widespread excessive rainfall persisted across much of the upper Midwest for weeks to months. In 2008, the excessive rainfall was focused mainly across central and eastern Iowa and lasted on the order of days to a couple weeks.

Timing, Duration and Geographic Scope

Another difference between the two floods was when they occurred. The 1993 flood in Iowa occurred mainly during the summer—with its peak in early to mid-July. Some record flooding occurred in the early spring to late summer on smaller streams however. In contrast, the 2008 flood in Iowa peaked occurred from late spring into early summer with its peak mainly in early to mid-June. The duration of the flooding differed in both events. In the 1993 flood, the flooding lasted on the order of weeks to months. In contrast, the flooding in 2008 lasted on the order of days to weeks.

The floods also differed in the geographic area impacted. The 1993 flood was broader in scope. Its greatest impacts were felt across much of Iowa—including the Mississippi and Missouri Rivers—as well as much of the surrounding Midwest region. The 2008 flood was more focused and intense. Its greatest impacts were felt mainly across eastern Iowa especially within the Cedar and Iowa River basins. Those locations which were impacted the most in 2008 experienced flooding which surpassed previous records by far more than in 1993. A prime example was Cedar Rapids—which saw levels on the Cedar River which surpassed previous records by 11 feet. In 1993, a total of 29 NWS river forecast points serving Iowa set new record high stages. In 2008, a total of 27 locations did. For many locations, the record crests set in 2008 exceeded their previous record crests which were set in 1993.

(Continued on page 4)

Heat Safety

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- Slow down, stay in the coolest place available (not necessarily indoors) and avoid strenuous exercise during the hottest part of the day. If you do not have air conditioning, visit an air conditioned location for part of the day if you are able. Such locations may include movie theaters, malls and public libraries.
- Strenuous outdoor activities should be reduced, eliminated, or rescheduled to the coolest time of day. Take frequent breaks if you must work outdoors.

For more information on heat, lightning and other Iowa weather hazards please visit:
www.weather.gov/dmx/?n=preparedness

2008 vs. 1993 Flooding

(Continued from page 3)

Changes at the National Weather Service

Many significant changes have occurred within the NWS between the 1993 and the 2008 floods.

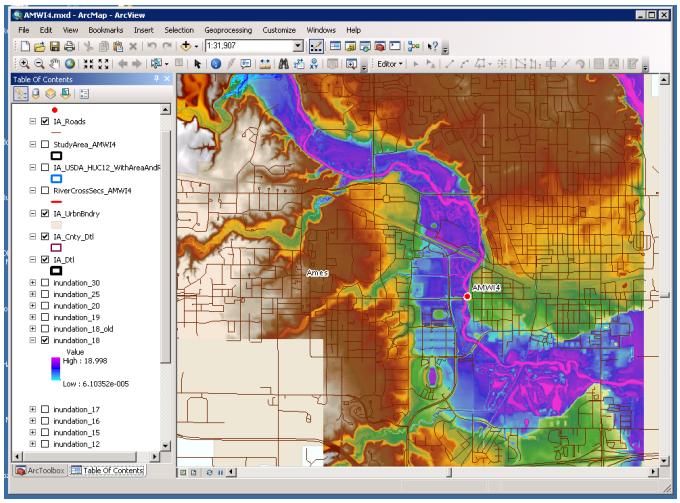
One significant change was structural. In 1993, the NWS in Iowa had a two-tiered structure with a state-level forecast office (WSFO) in Des Moines and four local Weather Service Offices (WSOs) serving Iowa—located in Sioux City, Waterloo, Dubuque and Moline, Illinois. The Des Moines WSFO provided many of the NWS forecasts for the entire state—including river and weather forecasts. Local WSOs provided their own severe weather warnings for their local areas. In the 1990s, the structure of the NWS in Iowa evolved into a single tier of five Warning and Forecast Offices (WFOs)—located in Des Moines; Sioux Falls, South Dakota; Omaha, Nebraska; La Crosse, Wisconsin and in Davenport. Each WFO serves its own County Warning Area (CWA). In addition, each WFO provides its own river and weather forecasts for its respective CWA.

Another significant change was the format content of river forecast and warning information. In 1993, river forecasts and warnings were delivered mainly via text products. After the 1993 flood, river forecasts and warnings expanded to the Web. The Advanced Hydrologic Prediction System (AHPS) was developed. AHPS included a Web-based static map with point-and-click river forecasts for NWS river forecast points. In fact, NWS Des Moines hosted the inaugural national demonstration project for AHPS within the Des Moines River basin. By the 2008 flood, AHPS grew and expanded to each NWS office. AHPS has further matured since 2008. It now includes a Google Maps interface and a host of other features, including flood inundation maps for selected locations.

Finally, from the 1993 to the 2008 flood the NWS became more collaborative in its river forecast process in Iowa. After the 1993 flood, the NWS began working more closely with other Federal hydrologic partners—such as the U.S. Army Corps of Engineers and the U.S. Geological Survey. In addition, the NWS began working more closely with state and local-level government partners in Iowa—such as the City of Ames for local flood forecasts along the Squaw Creek and South Skunk River. This collaborative approach resulted in river forecasts which tend to be based on more information and more accurate.

Looking Forward

The future holds exciting times for NWS river forecast and warning services in Iowa.



NWS GIS-based flood inundation map of Squaw Creek in Ames, Iowa

The NWS is expanding its collaborative partner base. In addition to the earlier mentioned partners, the NWS is also looking forward to working with additional partners such as those in academia—including Iowa State University, the University of Northern Iowa and the Iowa Flood Center (at the University of Iowa). These partners bring many river forecasting resources to the table.

The NWS is also looking forward to leveraging ever-improving technological resources. For example, Geographic Information Systems (GIS) have become an important part of NWS hydrologic services. In addition, high-resolution LiDAR digital elevation data is available for the entire state of Iowa. The NWS has already begun using LiDAR and GIS to develop flood inundation maps for select locations within the state. In addition, NWS hydrologic computer systems such as the Community Hydrologic Prediction Systems (CHPS) will give the NWS more options and flexibility in its river forecast process. One feature of CHPS will be the ability to plug in and use river forecast models from other partners—even those outside the NWS.

The sharing of information between the NWS and its partners—as well as the leveraging of technology—will help the NWS improve its river forecast and warning services in Iowa.

References

NWS Service Assessments, 1993 and 2008 floods:
http://www.nws.noaa.gov/om/assessments/index.shtml
Great Flood of 1993—10 Years Later (USGS):
http://il.water.usgs.gov/hot/Great_Flood_of_1993.pdf
Floods of May and June 2008 in Iowa (USGS):
http://pubs.usgs.gov/of/2010/1096/
NWS AHPS Web site for Iowa:
http://water.weather.gov/ahps2/index.php?state=ia

We want your feedback! We want to hear about your favorite stories and features, or if there is something you would like to see in an upcoming issue, let us know! Contact the editors at: Kenneth.Podrazik@noaa.gov or Aubry.Bhattarai@noaa.gov

Fire Weather Update

By Frank Boksa, Journey Forecaster

As fire weather season ramps up for 2013 I wanted to take a minute to remind everyone of the products the National Weather Service issues and what they are intended for.

The fire weather planning forecast is a product that is issued daily by 6AM from March 1 through November 15. During peak spring (March 1 through June 1) and fall (September 1 through November 15) seasons this product is issued twice daily by 6AM and 4PM. This product is for decision support to those people responsible for planning prescribed burns and to the general public who plan a legal burn on their property. The product is a seven day forecast with the first 36 hours broken into a tabular format that defines, in 12 hour increments, specific parameters such as relative humidity, precipitation, mixing height, transport winds, the grassland fire danger index as well as the Haines index.

The fire weather watch is a public product that the National Weather Service issues from 24 to 48 hours in advance of whenever there is a reasonable level of confidence by the forecasters that an area will have sustained wind speeds at or above 25 mph along with a minimum relative humidity of 25 percent or less and fuels (grasses and tinder) are sufficiently dry that they will quickly catch fire and/or allow for a fire to spread quickly. The intention of this product is for decision support for those who are in charge of any burning taking place in a county on either private or public land. It should raise a level of concern that any burning could lead to fires that get out of control. In general if a watch is in place, people planning a burn should consider alternative dates.

The red flag warning is a public fire weather warning product that the National Weather Service issues whenever we are expecting wind speeds at or above 25 mph in combination with a relative humidity of 25 percent or less and dry fuels. This product is a warning to people that it is dangerous to burn and burning is not recommended. The red flag warning is issued up to 24 hours in advance of when we expect meteorological conditions and dryness of fuels to create an explosive environment for fires to develop or spread. During a red flag warning event, decision makers in the fire weather community as well as state and county officials may want to consider burn bans or to begin contingency planning for additional staff to handle fires that could quickly get out of control.

For marginal fire weather conditions the National Weather Service may issue a special weather statement. The intent of this product is to convey to the general public that there is a concern for fire danger and that they should remain alert for possible upgrades to a red flag warning.

The spot forecast is not a public product. Only people from other government agencies or public agencies with a valid contract to do work for a government agency can request a spot forecast.

For information on the 2013 Annual Operating Plan and to view forecasts and fire weather planning tools, please visit the National Weather Service website at: http://www.crh.noaa.gov/dmx/firewx.php

2013 Cooperative Observer Length of Service Awards

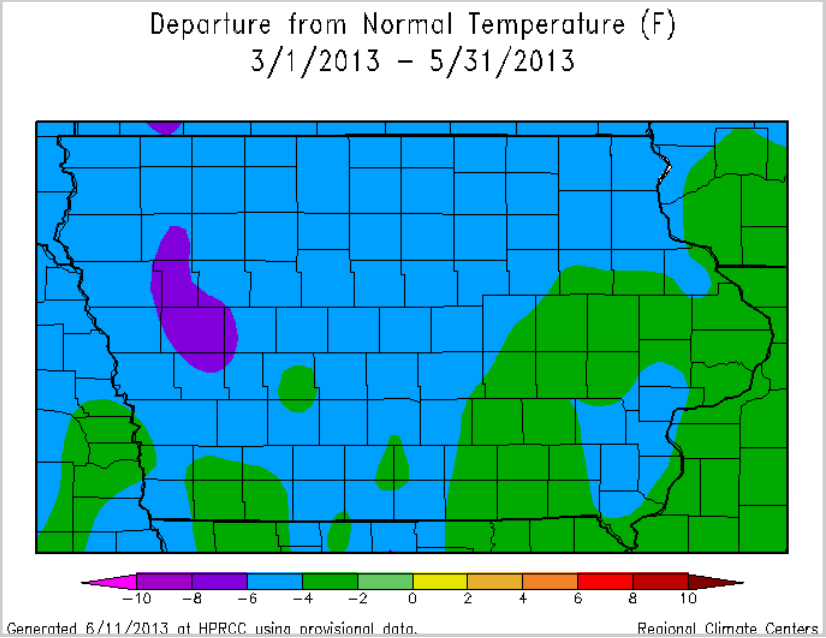
by Brad Fillbach, Hydro-Meteorological Technician/ Cooperative Program Manager

David Rueber of Kanawha, IA receives his 25 year length of service award.

Do you want to learn more about the National Weather Service? Then **You're Invited!**

What: Open House
Where: NWS Des Moines in Johnston, Iowa
Date: Saturday, September 21, 2013
Time: 10am— 3pm
Check back on our website for further details!

Spring and Early Summer Weather Review *By: Craig Cogil, Lead Forecaster*

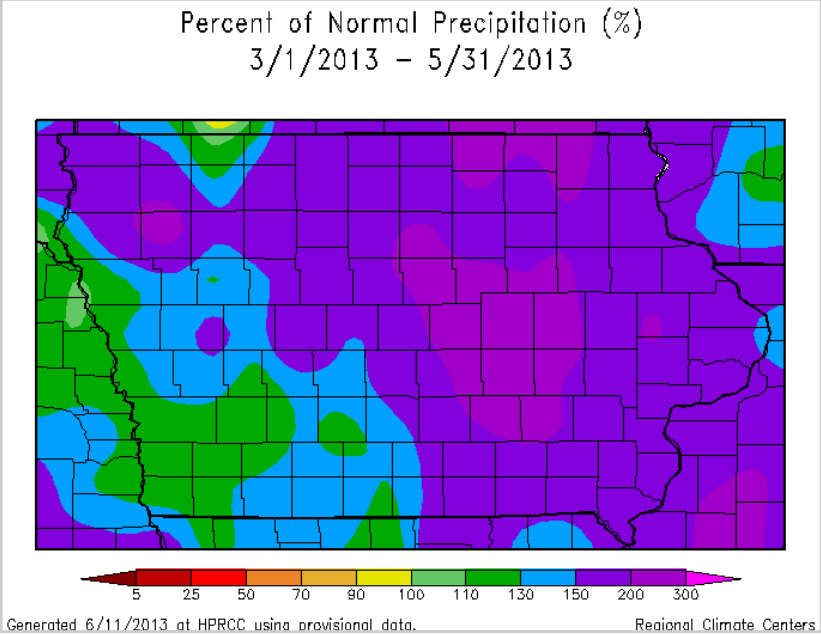


Temperatures:

In a large swing from the record warmth of last spring, this year saw temperatures much cooler than normal with persistent cool air arriving from Canada. There was also widespread cloudiness for much of this time along with ample precipitation. Average temperatures for March through May of this year were nearly 14 degrees cooler than last year's average during the same time. This slowed or stunted the growth of many plants and when combined with the moist conditions, hampered agricultural planting across much of the state.

Precipitation:

Rain and snowfall was normal for March across the state but the frequency and amounts of precipitation increased dramatically in April and May. In fact, both months saw statewide record rainfall and also set a record for the most rain during the Spring season. The generous rain also brought an end to the drought that had been plaguing the state since the middle of 2011 with most locations in the state reporting adequate to surplus soil moisture by early June. The heavy rain led to river flooding in many of the river basins across the state with minor to moderate flooding in most instances. There was also a very unusual snow event in early May across much of Iowa that broke many snowfall records for the month.



Iowa Statewide Averages and Rankings for Temperature and Precipitation *by Craig Cogil, Lead Forecaster*

Month	Temperature	Departure from Normal	Rainfall	Departure from Normal	Temperature Ranking	Precipitation Ranking
March 2013	28.5°F	-7.4°F	2.19"	+0.04"	17th Coolest	49th Wettest
April 2013	43.5°F	-5.4°F	6.63"	+3.12"	9th Coolest	1st Wettest
May 2013	59.0°F	-1.1°F	8.84"	+4.28"	51st Coolest	1st Wettest
Spring 2013	43.7°F	-4.6°F	17.66"	+7.44"	5th Coolest	1st Wettest

Rankings are based upon 141 years of records. All values are preliminary.

Preliminary Climatological Data for March through June 2013

Location	Month	Average Temp	Departure	Highest	Lowest	Rain / Snow	Departure
Des Moines	March	33.4°F	-5.9°F	64°F (29th)	14°F (21st)	1.67" / 9.6"	-0.63" / +4.4"
	April	48.6°F	-3.1°F	86°F (30th)	22°F (2nd)	6.53" / T	+2.67" / -1.8"
	May	62.0°F	-0.3°F	94°F (14th)	34°F (2nd, 3rd)	7.26" / 6.9"	+2.52" / +6.9"
	June	72.6°F	+0.8°F	93°F (26th)	47°F (3rd)	3.23" / 0.0"	-1.71" / NA
Mason City	March	24.9°F	-8.1°F	55°F (30th)	-1°F (7th)	3.38" / 23.8"	+1.15" / M
	April	41.7°F	-5.0°F	77°F (28th)	18°F (2nd)	8.27" / 1.0"	+4.52" / M
	May	56.5°F	-1.9°F	99°F (14th)	28°F (12th)	8.09" / 9.5"	+3.41" / M
	June	67.8°F	-0.3°F	91°F (22nd)	42°F (3rd)	6.44" / M	+1.30" / M
Waterloo	March	26.6°F	-9.2°F	56°F (29th)	-4°F (7th)	2.57" / 11.2"	+0.51" / -4.8"
	April	44.2°F	-4.7°F	83°F (30th)	16°F (3rd)	7.12" / 0.1"	+3.41" / -1.7"
	May	59.2°F	-1.3°F	96°F (15th)	32°F (2nd, 3rd, 13th)	10.81" / 1.7"	+6.28" / +1.7"
	June	69.1°F	-0.9°F	90°F (22nd)	44°F (3rd)	4.68" / 0.0"	-0.30" / NA
Ottumwa	March	32.1°F	-6.7°F	61°F (29th)	7°F (2nd)	2.02" / M	-0.22" / M
	April	47.8°F	-3.1°F	87°F (30th)	16°F (2nd)	8.58" / M	+5.18" / M
	May	60.8°F	-0.6°F	91°F (14th)	32°F (2nd, 3rd)	9.82" / M	+5.11" / M
	June	70.4°F	-0.6°F	93°F (22nd)	46°F (3rd)	2.39" / M	-2.70" / M

Storm Spotter Terms

C Z P V L U A S J O G A F K M C S X U P D R A F T J	ANVIL
N S W I N F L O W N O T C H E D U P O S A C I T W S	CUMULONIMBUS
T E T N H Z C C X O R T T P G J P X V S Q P K Z F I	DAMAGINGWIND
O J C O J A G T A I L C L O U D E X R Y S L R S I T	DEBRIS
R J Y J R Q I K J G B T L Q F D R U N X T H K Z I K	DOWNDRAFT
N N I L A M G L E Q L M W C O I C I O O Q N A Q B L	FLANKINGLINE
A J S V E Z S Y S U B W L O E V E Q V E I T V I N U	FLASHFLOOD
D Y J W D R K P H H X O L S Y O L Z E A R C O P L V	FUNNELCLOUD
O F K R Z M U N O H A F M J I F L D R Z I Z W R J I	GUSTFRONT
Z U J A A X P X M T H F G Q U M J Y S E Q V N R H L	HAIL
B N A I Q N W E J S T S T I Q L V L H O B R M O A S	HAILSHAFT
H N A N T E X V A Y W E C U X A M M O Q G M R G I T	HEAVYRAIN
B E N F V P C L F H M I R W E D R Q O Z E N C U P R	INFLOWNOTCH
P L V R L V F B L J R A J H G I O A T T P C E S F I	LIGHTNING
L C I E F Y D T A H B A M F V G Q Z I F Q W T T I A	MAMMATUS
S L L E R W Q L N Y M X S M Y O U V N Z X W T F B T	OVERSHOOTINGTOP
I O P B M U S P K W O D A M A G I N G W I N D R N I	RAINFREEBASE
F U R A C E H P I A A T R B W T L P T M R D A O S O	SCUD
O D W S U Y E F N L F V H O K O U F O E Z B I N A N	SHELFCLOUD
B Y J E U Q L C G L N A S W I V B S P I A G U T T S	STORMSPOTTER
K E D B Q H F M L C O T C I P Z C D O W N D R A F T	STRIATIONS
L V Y H I H C R I L E C U M U L O N I M B U S M H Q	SUPERCELL
E T Y D Z M L Z N O S H D P R W L I G H T N I N G N	TAILCLOUD
O O X U T Q O F E U J D H G A D E B R I S D F W A S	TORNADO
U H I J A E U E F D P S A E X M W T S N K T I M F W	UPDRAFT
U T R A R D D E O L D H L P V O N G V F H F S V J M	WALLCLOUD

Answer Key

One for the Ages: A Review of the Momentous May 1-3, 2013 Snowstorm

by Ken Podrazik, Journey Forecaster and Kevin Skow, Meteorologist Intern

A once-in-a-lifetime snow storm occurred in early spring across much of the region including most of Iowa. The heavy snow fell not too long ago, from May 1 to May 3, 2013. The heaviest snow band set up from south-central Iowa northward into southeast Minnesota and western Wisconsin where 10-plus inch snowfall reports were not uncommon. Warm road temperatures across Iowa helped to initially melt the falling snow, but conditions quickly deteriorated across the region. The heavy, sticky wet snow led to several vehicle accidents, school closings, and power outages from damage to trees and power lines. Snow began to fall during the evening of May 1 and never let up until Friday May 3. In fact, snow fell continuously at the Des Moines International Airport once it started on May 2 at 6:34 a.m. and persisted until 2:48 p.m. on May 3. An uninterrupted 31 hours and 14 minutes of snowfall!

Snowfall totals ranged from nothing or trace amounts in eastern Iowa to over a foot across sections of central Iowa as shown in figure 1. Multiple, long standing snowfall records were broken across central Iowa as the snow piled up high and quick. The higher totals fell over portions of south central and north central Iowa resulting in a new statewide monthly (May) record of 13.0 inches set in Osage, Iowa. The previous statewide record for May was 10.0 inches set back on May 28, 1947 in LeMars, Iowa. The highest statewide snowfall average was 3.3 inches, making the May 1-3 the greatest snowstorm in respect to statewide average snowfall during the month of May since records have been kept. The previous statewide average was 1.2 inches set on May 28, 1947. The statewide average is based on official Cooperative Observers (CoOp) for the National Weather Service. Many individual locations broke records which included the official NWS observations at Des Moines, Waterloo, and Mason City. There were also several Coop sites that set new records as well. Many of the climate records for snowfall date back as far as 1878 for Des Moines, 1895 for Waterloo, and 1893 for Mason City. See the table 1 for a summarized look at the broken records for Des Moines during this snowstorm. Click here for Waterloo and Mason City records.

The Des Moines (DMX) WSR-88D dual-pol radar captured many intriguing features and signatures during this epic snowstorm. Dual-pol radar was installed at the DMX WSR-88D in September 2012 and the upgrade produced three new products for meteorologists to discern during inclement weather. Differential Reflectivity (ZDR) determines whether the particles are round or oblate and whether they are oriented horizontal or vertical. The Correlation Coefficient (CC) reveals whether or not the particles in the sample volume are similar in shape and size. The Specific Differential Phase (KDP) determines the water content of the precipitation. These dual-pol products helped pinpoint the location of the transition zone between rain and snow during the May snowstorm. It was also very helpful in discerning the different precipitation types and the various forms of rain drops and snowflakes; see figure 2. Before dual-pol was installed, forecasters generally had to rely on surface observations and/or reports when and where the changeover from rain to snow had occurred. This new technology allows forecasters to have higher confidence in the location of the heaviest snowfall.

For a detailed Meteorological explanation on how the heavy snow developed as well as an in-depth look at Dual-Pol Radar during the event, see our event overview: http://www.crh.noaa.gov/dmx/?n=may1-3snow

Click here for a 48-hour base reflectivity loop of the event beginning around noon Wednesday May 1 and ending around noon May 3, 2013.

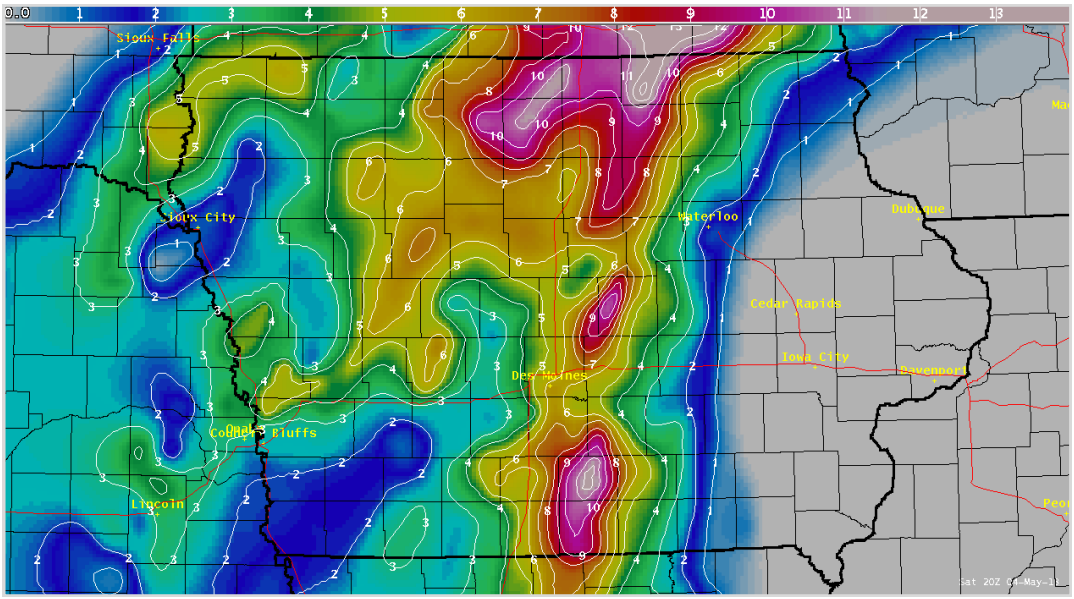


Figure 1: Snowfall total accumulation map from the May 1-3, 2013 snowstorm

Des Moines Records Broken during May 1-3, 2013 Snowstorm

Snowfall Record	New Record	2013 Date	Previous Record	Previous Record Date
Daily Snowfall Record	3.4"	May 2	T	1976
Daily Snowfall Record	3.5"	May 3	1.2"	1907
Monthly Highest Daily Total	3.5"	May 3	1.2"	May 3, 1907
Total Monthly Snowfall	6.9"	May	1.3"	1907
Latest Snowfall 3.5" or greater	3.5"	May 3	7.0"	April 29, 1907
Temperature Record	**New Record**	**2013 Date**	**Previous Record**	**Previous Record Date**
Daily Low Maximum	41°F	May 2	47°F	1953
Daily Low Maximum	35°F	May 3	41°F	1967
Monthly Low Maximum Temperature	35°F	May 3	39°F	May 5, 1944

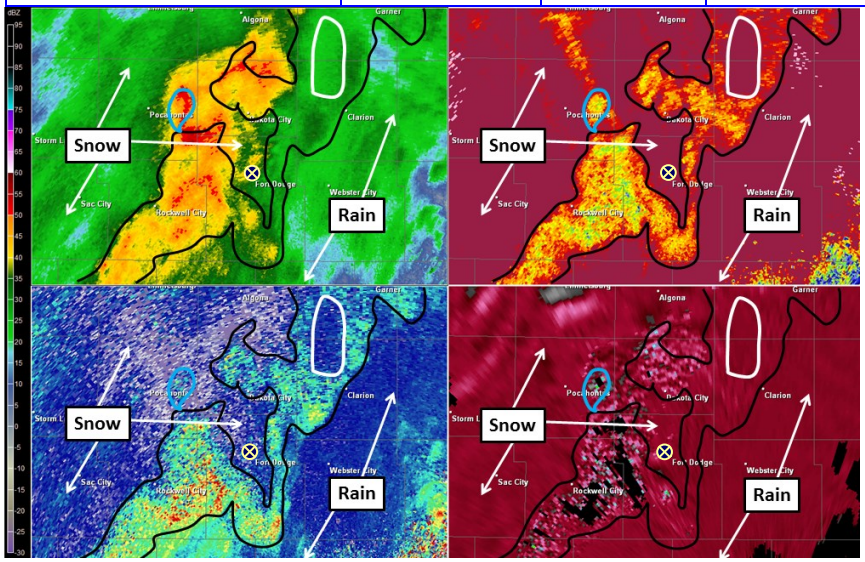


Figure 2: A zoomed-in look at dual-pol products with base reflectivity in the upper left, Correlation Coefficient in the upper right, ZDR in the lower left, KDP in the lower right. The image depicts the freezing layer near Fort Dodge, Iowa (yellow X/purple marker) on May 2 at 10:54 p.m. The black solid line outlines the transition zone from rain to snow. On the right side of the black line, the precipitation is all rain where the ZDR values are closer to 1 dB and the left side of the black line is all snow where the ZDR values are near 0 dB. In the transition zone, the precipitation is a mix of rain and snow, possibly even sleet. The white oval inside the transition zone is a small area of all rain which is determined when the ZDR is close to 1 dB and the CC is a uniform number.

Lightning Safety *by Jeff Johnson, Warning Coordination Meteorologist*

Summer is primetime for one of the deadliest weather phenomena—lightning. On average, lightning kills 54 people in the United States each year but lightning deaths have fallen in recent years. Want to learn more about lightning safety? Checkout our lightning safety page at: http://www.crh.noaa.gov/dmx/?n=preparesvrlghtsafety.

In general, lightning safety is pretty simple. Just remember our slogan, "When thunder Roars, Go Indoors." To help promote lightning safety, the National Weather Service held its annual Lightning Safety Week from June 23-29, 2013. Here is the campaign's website: http://www.lightningsafety.noaa.gov/. Everyone should take safety actions when there is a lightning threat. Are you going to respond, or just ignore the warnings and risk everything in a deadly game of chance? Everyone has to decide that for themselves. As someone who has been struck by lightning in the past, I plan on going indoors whenever I see lightning or hear thunder! when they were fatally struck by lightning.

2013 Lightning Deaths in America

Date	State	Age	Sex	Location	Activity
Apr 23	MO	57	F	Front yard	Under trees
May 10	LA	41	M	In boat on lake	Fishing
May 21	TX	32	F	Outside restaurant	Standing
May 26	IL	29	M	In boat on river	Fishing
May 28	FL	51	F	On Beach	Walking
May 30	IL	17	F	In Park	
Jun 8	FL	57	M	In boat on lake	Fishing
Jun 26	FL	35	M	Scaffolding	Climbing down

Lighting deaths to date 2013 in America. Note everyone was outdoors!

Outlook for Summer into Fall

by Miles Schumacher, Senior Forecaster

The spring and early summer of 2013 was certainly quite different from last year. Temperatures took a turn to the cooler side with sub-normal temperatures being the rule. The meteorological winter, the months of December, January, and February, averaged warmer than normal, however the winter season seemed more significant with the cool weather this spring and record heavy snowfall occurring in May. On the positive side, the cool and wet weather this spring replenished much of the soil moisture following the drought last summer.

The state of temperatures of the equatorial Pacific Ocean has generally remained in the neutral area, meaning the state was neither El Niño (cold) nor La Niña (warm). The circled area in figure 1 shows the rather chaotic water temperature pattern. It is neither a clear La Niña nor El Niño event, though the pool of cool water over the eastern Pacific gives the pattern a slightly cool episode look. The Pacific Decadal Oscillation (PDO) is still present as can be seen by the cooler than normal water extending from California southwest to the central Pacific southeast of Hawaii.

The atmosphere typically follows a three to seven year cycle between El Niño and La Niña. Depending on the phase of the PDO, El Niño/La Niña is favored during warm/cold phase of the PDO. The Pacific is currently in the cold phase of PDO. La Niña conditions are favored by a two to one margin during the cold phase. The pattern has been relatively cool for the past two years. The sea surface temperature (SST) departures were positive briefly last spring and summer, however a full -blown El Niño failed to develop. Although we are likely to see the SST departures rise again this summer, it is not likely that they will breakout into an El Niño pattern. This would be a typical occurrence, similar to what was observed during the last cold phase of the PDO, roughly from1947-1977. Model forecasts suggest the SST pattern across the equatorial Pacific is likely to

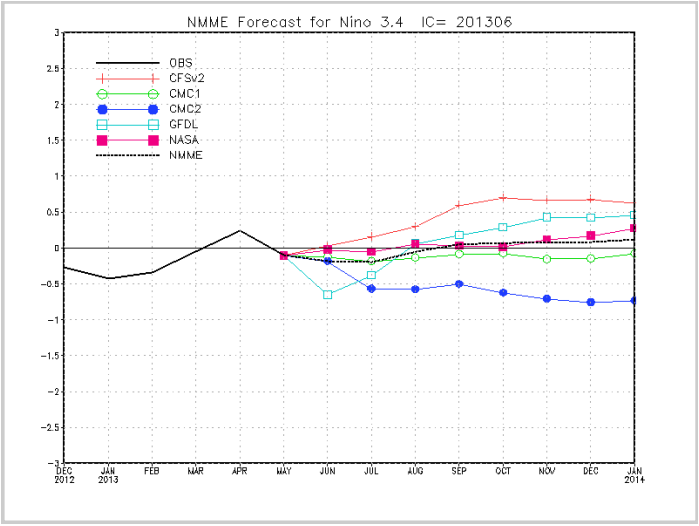


Figure 2: Sea surface temperature departure for the past two 3-month seasons, and the projection into the Winter 2013-14. Departure in degrees Celsius is shown on the ordinate, with time on the abscissa.

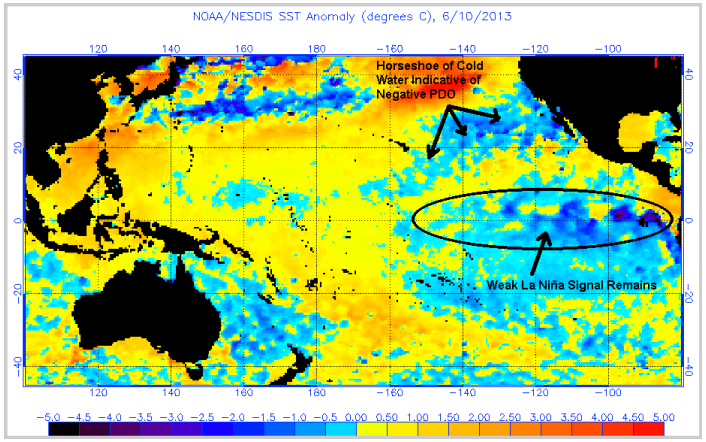


Figure 1: Sea surface temperature departure from normal, equatorial Pacific taken on June 10, 2013.

remain close to neutral through this summer, and, in fact, into the next Boreal winter. Figure 2 shows the mean forecasts from several models of Pacific SST departure. Each model is run several times, however only the average is shown here for clarity. The solid black line beginning on the left is the observed departure. The dashed black line is the mean of all models, while the colored lines indicate the individual model runs. As can be seen in figure 2, the most likely outcome through the next six months is a near normal, or neutral state. To be either an El Niño or La Niña the average temperature departure must be at least 0.5°C above or below normal, respectively, or more for three consecutive 90 day seasons.

Although in meteorology no two years are the same strictly speaking, one can look at weather patterns of the recent past to give some indications of near term weather trends in the future. This forecast is based in large part on the best fit from several of the years that were the most similar to the spring season just past. Considerations were also made for the state of the Pacific and expected near normal conditions, as well as other factors that influence our weather pattern. The Pacific SST's are not giving a strong signal for the summer and fall weather.

The very heavy rainfall this spring has changed the outlook for the summer. Due to the wet ground, and no strong signal to indicate that Iowa will return to drought conditions, the summer is expected to be much different than last year. The soil moisture is a contributing factor. The relatively wet conditions are likely to keep temperatures from rising to the lofty levels of the summer of 2012. Drought conditions exist just to the west of Iowa. Heat is likely to build on the High Plains, leading to some spikes of hot weather this summer. Though the very warm weather may be nearby, each episode is not likely to last for very long. Overall, the rest of the summer is likely to average just slightly above normal.

(Continued on page 11)

Fall Outlook

(Continued from page 10)

The negative PDO pattern shown in figure 1 tends to result in the development of upper level low pressure off the west coast of the U.S. This in turn results in an enhanced upper level ridge of high pressure over the Rockies. The two notable effects of this is to shift the hot weather farther west, and provide a better chance for thunderstorms over the north central into the central parts of the U.S.

With this pattern there is a greater likelihood for the pattern to be more variable this summer with periods of warm weather broken up by stronger pushes of cooler air than we saw last year. The total number of 90 degree days for the summer is expected to be close to normal, considerably less than the double the normal amount of last year. With the very dry conditions to the west of Iowa, the odds favor average temperatures to be a little above normal. Rainfall is expected to be close to normal for the July through August period, see figure 3.

Although the signals are relatively weak, temperatures this fall are expected to lean toward the cool side. Cool Canadian air will be more dominant than is typical for the fall. At this time it does not appear that temperatures will be more than slightly below normal. With cooler air moving in from Canada, it will be drier than normal as well. The rainfall deficit should be minimal over northwest Iowa for the fall, ranging to around an inch over the southeast; see figure 4 for details.

It will be important to monitor the oceanic and atmospheric patterns over the next several months. Although precipitation for the rest of the summer into the fall is expected to be sub-normal, it does not appear that we will return to severe drought conditions again.

These outlooks are based more heavily on statistics than many of the methods used by the Climate Prediction Center. The complete set of official forecasts from the Climate Prediction Center can be found on our website.

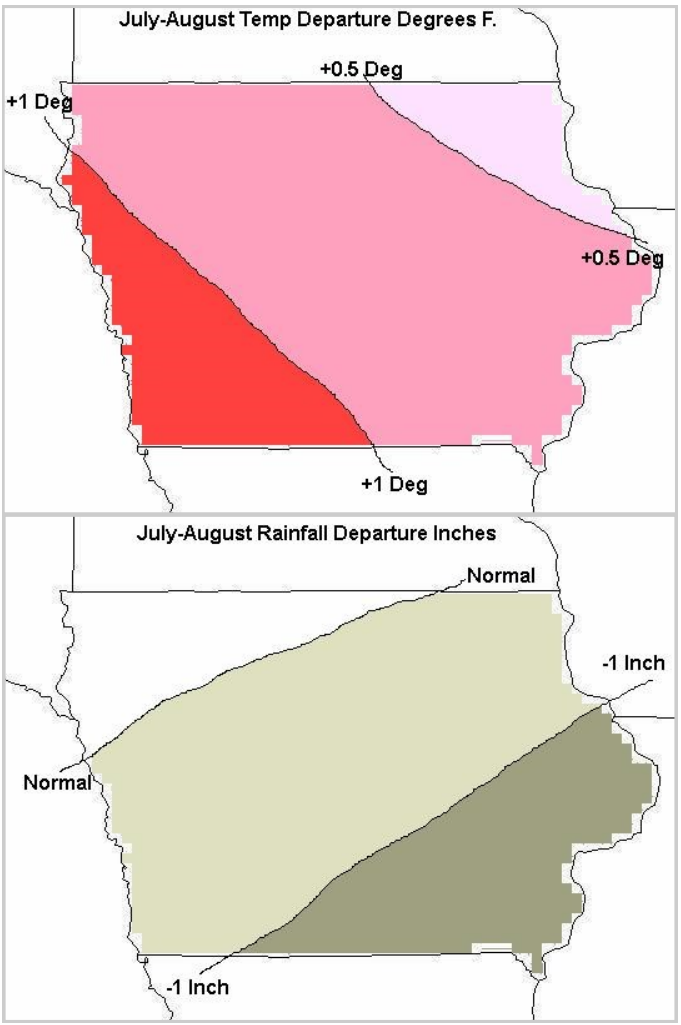


Figure 3: Mean temperature (top) and precipitation (bottom) departure for July through August.

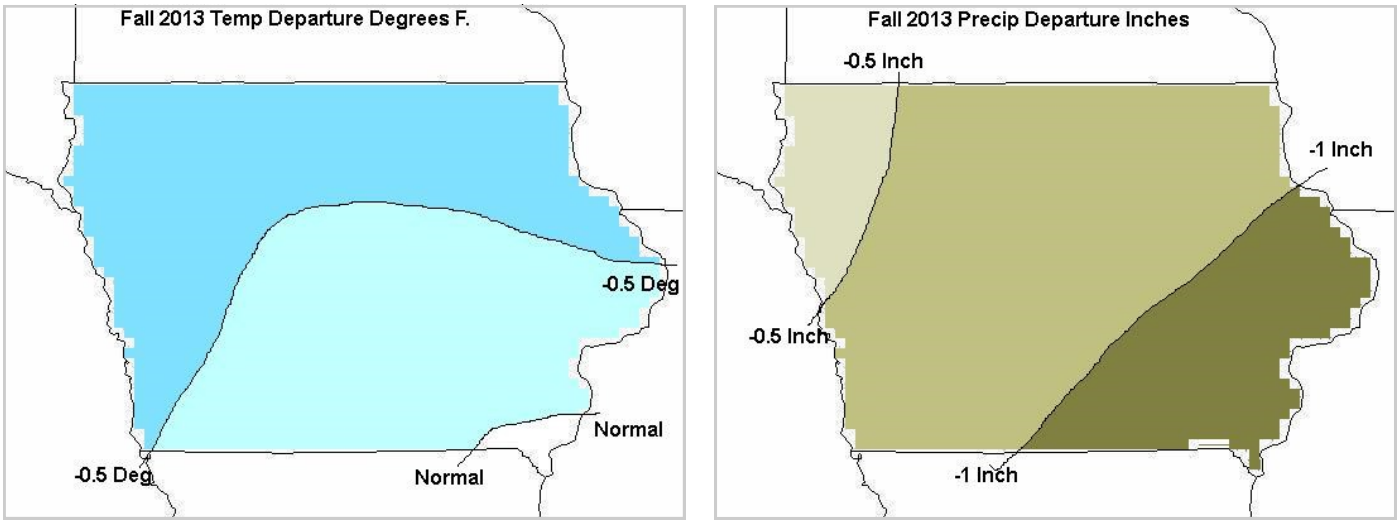


Figure 4: Mean temperature (left) and precipitation (right) forecast for the Fall of 2013.

Overview of the NWS Des Moines DSS Operations during a Significant Event: May 19, 2013

by Mindy Beerends, Journey Forecaster

The NWS continues to move forward with its strategic plan to "Build a Weather-Ready Nation" through the forecast and warning efforts of local offices such as NWS Des Moines. These efforts include an increasing focus on Decision Support Services (DSS). These efforts are most noticeable prior to significant weather events when planning and preparation must be put into action. Therefore we would like to show you the products and actions taken here at the NWS Des Moines office prior to a significant severe weather event. In this example from May 19, 2013, three tornadoes touched down across central Iowa causing a significant impact to local partners. As a review, the primary goal of DSS activities is to provide concise interpretation of weather data in a fast, reliable and accurate manner to our core partners, giving them focused support during high impact events, emergencies, or disasters where weather is a factor in the decision-making. The amount and type of DSS support varies from event to event, but the overall process is very similar.

Below is a list of some of the products issued for this event. The products are separated into two categories: products issued daily, regardless if significant weather is forecast and event-driven products/activities, which are only issued when significant weather is forecast. If you are interested in checking out any of these products, links are provided to the latest versions of each product/item.

Daily Products:

- Hazardous Weather Outlook - HWO (7-day outlook of significant weather) – First mention of severe weather for Sunday, May 19, was in the HWO issued on the Monday, May 13, at 5:02 a.m. CDT. (This was the first outlook to include Sunday). It stated:

```
.DAYS TWO THROUGH SEVEN...MONDAY THROUGH SUNDAY

PERIODS OF THUNDERSTORMS ARE FORECAST THURSDAY THROUGH SUNDAY...WITH
THE BEST POTENTIAL FOR SEVERE WEATHER SATURDAY NIGHT INTO SUNDAY.
```

The 5:00 a.m. CDT issuance on Thursday, May 16, included the first mention of tornadoes, large hail and damaging winds as the HWO stated:

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.DAYS TWO THROUGH SEVEN...FRIDAY THROUGH WEDNESDAY

A FEW THUNDERSTORMS ARE POSSIBLE EARLY FRIDAY THEN PERIODS OF
THUNDERSTORMS ARE FORECAST SATURDAY NIGHT THROUGH TUESDAY. THERE
IS A THREAT FOR SEVERE WEATHER SATURDAY NIGHT THROUGH MONDAY WITH
THE MOST SIGNIFICANT POTENTIAL SUNDAY AFTERNOON INTO MONDAY. LARGE
HAIL...DAMAGING WINDS AND A FEW TORNADOES ARE POSSIBLE DURING THIS
PERIOD.
```

The 5:03 a.m. CDT issuance on the morning of Sunday, May 19, stated:

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.DAY ONE...TODAY AND TONIGHT

ISOLATED TO SCATTERED THUNDERSTORMS ARE EXPECTED DURING THE DAY
WITH A SEVERE STORM POSSIBLE PRODUCING LARGE HAIL OR A DAMAGING
WIND GUST. HOWEVER...MUCH MORE WIDESPREAD THUNDERSTORM ACTIVITY
IS EXPECTED TO DEVELOP BY MID TO LATE AFTERNOON AND SPREAD
NORTHEAST ACROSS THE AREA INTO TONIGHT. SIGNIFICANT SEVERE
WEATHER IS EXPECTED WITH THESE STORMS LATER THIS AFTERNOON INTO
THE EVENING WITH ALL MODES OF SEVERE WEATHER POSSIBLE. GOLF BALL
HAIL...DAMAGING SURFACE WINDS IN EXCESS OF 60MPH AND A FEW
TORNADOES WILL BE POSSIBLE DURING THIS TIME.
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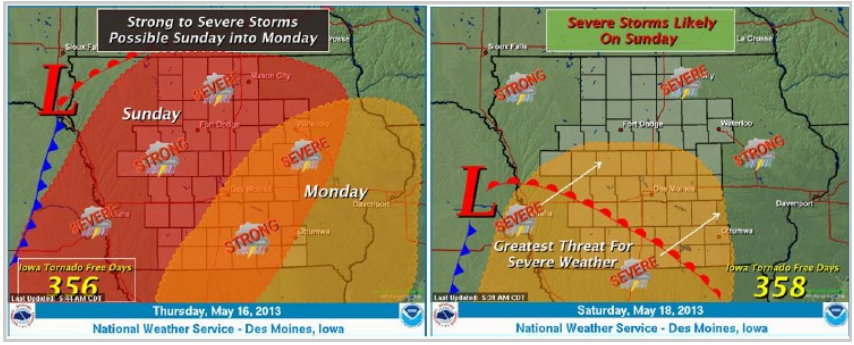

Figure 1: NWS Des Moines creates a Weather Story at least once a day and is posted to Facebook and Twitter automatically. The Weather Story highlights the most significant weather over the next 7 days. These two are from Thursday May 16 (left) and Saturday May 18 (right), highlighting the severe weather potential on Sunday May 19, 2013.

(Continued on page 13)

DSS Overview

(Continued from page 12)

- The Weather Story highlights the most significant weather expected in the next 7 days (See Figure 1).
- **Social Media:**
  - Facebook Posts: Facebook is used similar to Twitter as a way to send out information prior to the event and is also monitored for severe weather reports during an event.
  - Twitter Tweets: Twitter (see Figure 2) was used to get out information prior to the event and even some information during the event. NWS Des Moines also gave pointers for reporting severe weather. Twitter feeds including #nwsdmx, #iawx, #iowaweather, etc were monitored throughout the event by NWS staff to gather any severe weather reports via Twitter.

Figure 2: NWS Des Moines Twitter Feed on May 19, 2013 is a good example of what can be expected during severe weather events.

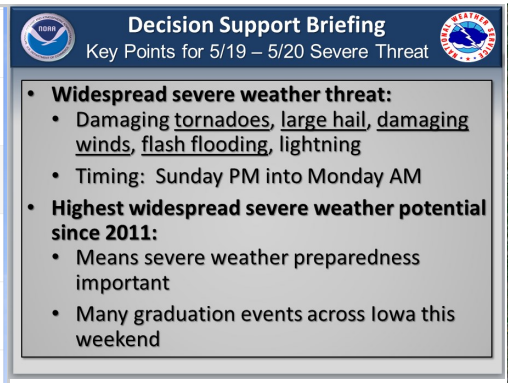

Figure 3: MMWB template displaying the key severe weather threats for May 19, 2013.

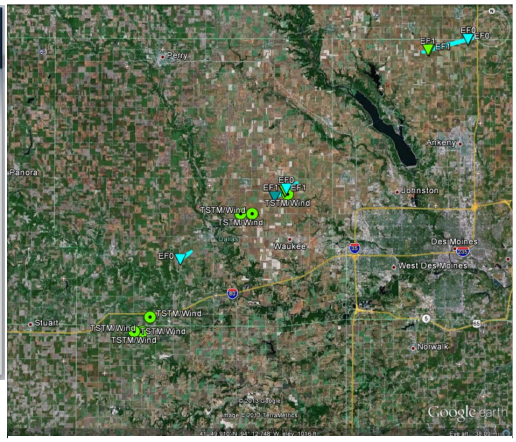

Figure 4: Example of storm survey damage path for May 19, 2013.

Event-Driven Products/Activities:

Significant Weather Watches – The Storm Prediction Center and NWS Des Moines issues watches when significant weather is expected within a few to 48 hours prior to the event depending on the type of watch. For this event an initial Tornado Watch #180 was issued at 1:10 p.m. valid until 9:00 p.m. CDT for approximately the northern half of the state. Tornado Watch #183 was issued for the southern half of the state at 3:00 p.m. CDT and valid until 10:00 p.m. CDT.

Multi-Media Web Briefings (MMWBs) – Web Briefings were conducted on May 17, 18, and 19 focusing on this severe weather event and continued potential for severe weather into Monday, May 20. The briefings were posted on our news headlines on our webpage, on our Facebook and YouTube pages, and to Twitter. See Figure 3 for example of a slide utilized in the web briefing.

Metro Incident Command Radio Network (MICRN) Briefings – These briefings are used to provide information to all entities with access to the MICRN radio network in Boone, Story, Dallas, Polk, Jasper, Madison, Warren, and Marion Counties. This consists mainly of State and County Emergency Management Officials, First Responders, Area Public Works Departments, Iowa Air National Guard, Metro Planners Group, Iowa DOT, Des Moines Airport and Metro Hospitals. When thunderstorms, severe weather, and/or winter weather is approaching the MICRN area, a briefing of expected conditions and timing of these conditions is given to the entire network. The network is also used for additional communications such as the dissemination of warnings and for the entities to relay severe weather reports directly to the NWS.

Storm Damage Surveys – Damage surveys are conducted by NWS personnel after significant weather events to determine if damage is from straight-line winds or tornadoes. If the damage is produced by a tornado, the damage survey team determines the strength and track width and length of the tornado/tornadoes. The EF scale is used to rate the strength of a tornado/tornadoes based on the damage that was produced. For this event a damage survey team consisting of the DMX Science and Operations Officer and a Lead Forecaster surveyed reported damage throughout portions of Madison, Dallas, Polk and Story Counties on Monday, May 20. The survey concluded that three tornadoes touched down during the event with two in Dallas County and one tornado that began in Polk County and traveled into Story County before lifting. The damage in Madison County was found to be Straight-Line Wind Damage. (Photo: Preliminary Storm Survey Results with Geocoded Points from areas of damage throughout the survey) http://www.crh.noaa.gov/images/dmx/StormSurveys/2013/StormSurvey_5192013.pdf

2013 Iowa Severe Weather Season Recap Through Mid June

Kevin Skow, Meteorologist Intern

The 2013 Iowa severe weather season started out as 2012 had ended, on a quiet note. With unseasonably cold air trapped across the region, news headlines were instead dominated by our extended winter and late season snowstorms well into early May (see "One for the Ages: A Review of the Momentous May 1-3, 2013 Snowstorm"). There were a smattering of severe hailstorms from late March through the first half of May, but no tornadoes during these first two months of Iowa's climatological "tornado season." This tornado drought, coupled with the earliest end to Iowa's tornado season on record in 2012 (May 24), enabled Iowa set a record for the most consecutive days between tornadoes on May 15. The old record was 355 days set between May 5, 1955 and April 26, 1956. Iowa almost made it a full year without tornadoes, but a severe weather outbreak on May 19 solidified the 2012-2013 record at 359 days.

Figure 1: One of the many photos that capture the May 1-3, 2013 Snowstorm across Iowa. Photo Courtesy of Kelsey Olson and KCCI.

On May 19 a supercell thunderstorm over southwestern Iowa morphed into a squall line to the southwest of Des Moines and produced three brief tornadoes along its leading edge in Dallas and Story counties. These tornadoes were rated either EF1 or EF0 and impacted several homes and farms along their paths. This storm complex and others that followed during the evening and overnight hours also produced widespread straight-line wind damage across southern and eastern Iowa. A cold front moving through Iowa on May 20 also ignited a line of strong to severe storms over central Iowa, including the Des Moines metro area. The back page photo was taken on May 20, 2013 in Grimes, Iowa. Many people in the metro witnessed several wall clouds and funnel clouds as the storms passed through.

Memories of the 2012 drought disappeared over the Memorial Day weekend and the week that followed as wave after wave of thunderstorms stalled out across

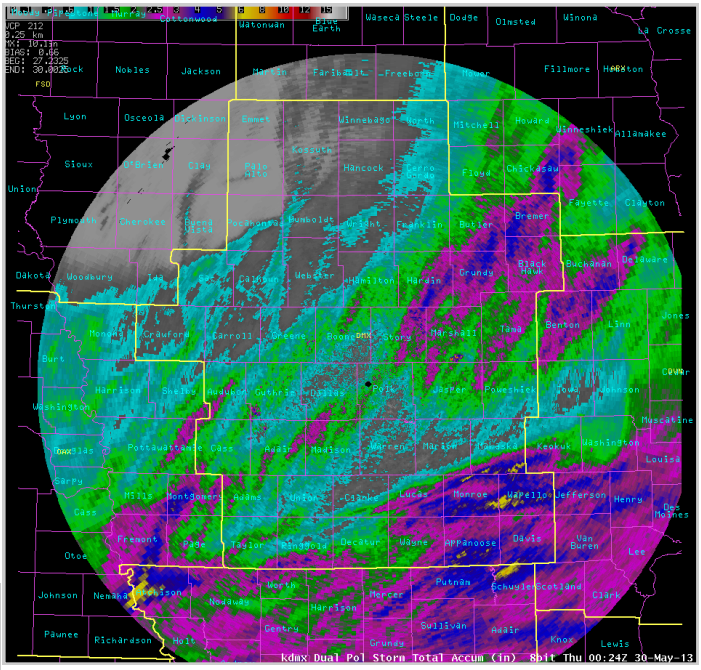

Figure 1: Dual-pol 24-hour Storm Total Rainfall Accumulation ending at 7:30 p.m. May 29, 2013.

the state and dropped copious amounts of rain. Some of the hardest hit areas were over east central Iowa, including Jasper, Marshall, and Poweshiek Counties where flash flooding washed out dozens of roads and bridges. Runoff from this rain led to record flooding along the Iowa River in and around Marshalltown. Much of central and south central Iowa also experienced flash flooding at one point during this week-long deluge. Severe thunderstorms also produced brief, weak tornadoes over far southern Iowa on May 26 and over far northeastern Iowa on May 29. A line of thunderstorms lifting north across eastern Iowa dropped a pair of EF1 tornadoes south and west of the Davenport area on May 30, damaging the towns of Conesville and Buffalo. The following day a rain shower over northeastern Iowa produced a short-lived landspout tornado in Floyd County. Landspouts (also known as "cold-air funnels") are a special type of tornado that form under weak storms and rarely touch down or produce any damage.

The next severe weather outbreak took place on June 12 across northern Iowa. Numerous severe storms developed across the region, with one storm in particular producing five tornadoes over the span of an hour across Wright and Franklin counties. The town of Belmond was grazed by two tornadoes, including a strong EF3 that severely damaged several homes and businesses. The storm that spawned these tornadoes was known as a "cyclic supercell" or a storm capable of generating multiple tornadoes, possibly at the same time. This was the case with the Belmond storm, where two tornadoes were occurring at the same time at several

(Continued on page 15)

2013 Recap

(Continued from page 14)

points during its lifecycle. This event gave the NWS in Des Moines an opportunity to utilize new surveying technologies for the first time. In addition to plotting highly detailed GIS tracks (started in 2012), the office used a remote controlled quad-copter (graciously provided and operated by Adam Frederick) to photograph swaths of damage. Furthermore, the office requested that a surveillance satellite make a pass over the region and photograph the damage paths. These two new survey tools helped the office create very detailed and accurate tornado paths for release to the public within a week of the tornadoes.

Climatologically, June is the most active severe weather month in Iowa in terms of the average number of tornadoes and straight-line wind storms. While the threat for tornadoes tapers off through the months of July and August, they have occurred in every month of the year in Iowa. Severe hail and wind storms can also still easily form and cause substantial damage through the end of summer. Therefore, even though we have passed our peak severe weather month, still keep an eye to the sky for threatening weather.

For more a detailed look at some of the significant weather events in 2013 as well as in the past several years, visit our Significant Weather Events page on our website: http://www.crh.noaa.gov/dmx/?n=sigevents

Figure 3: One of the images the quad-copter captured during storm survey on June 12, 2013. Photo courtesy of Adam Frederick. The black arrows show the tornado track and the blue arrow showing the Rear Flank Downdraft winds.

Figure 4: Adam Frederick's quad-copter in action during the storm survey on June 12, 2013.